

SYSTEMS ANALYSIS METHODOLOGY
FOR LARGE SCALE SYSTEMS

TASK MANAGER: KAREN L. MOE
GSFC CODE 522.2
RTOP NO. 506-58-16

THE OBJECTIVE OF THIS TASK IS TO DEVELOP A SYSTEMATIC APPROACH OR METHODOLOGIES FOR DEFINING AND EVALUATING ALTERNATIVE STRATEGIES FOR DEVELOPING DATA PROCESSING AND MANAGEMENT SYSTEMS. VARIOUS TECHNIQUES AND SYSTEM ENGINEERING TOOLS SUCH AS N-SQUARED INTERFACE CHARTS, FUNCTIONAL DECOMPOSITION TREES, SYSTEM MODELS, DE MARCO DIAGRAMS, ETC., ARE INTEGRATED TO DEVELOP AND PRESENT TO THE ANALYSTS AND USERS AN EARLY DEFINITION OF SERVICES DESIRED ALONG WITH PROBABLE AND COMPATIBLE OPERATIONS CONCEPTS. IN ADDITION, THE OUTPUTS OF THESE INVESTIGATIONS CAN IDENTIFY, EARLY ON, POTENTIAL DATA MANAGEMENT ISSUES, KEY SETS OF DATA CHARACTERISTICS, PREVIOUS APPROACHES THAT WERE EFFECTIVE, AND ANY NEW TECHNOLOGIES THAT MAY BE BENEFICIAL TO EXPLORE. AN IMPORTANT GUIDELINE RESULTING FROM THIS INTEGRATED EFFORT IS TO IDENTIFY PERFORMANCE DRIVERS AND TRADEOFFS NECESSARY FOR A SPECIFIC DEVELOPMENT EFFORT. THESE METHODOLOGIES ARE PLANNED TO BE ASSESSED BY APPLYING THEM TO MISSIONS SUCH AS UARS, HITCHHIKER-G, EARTH OBSERVATION SYSTEM, AND SPACE STATION PAYLOAD OPERATIONS.

SYSTEM ANALYSIS METHODOLOGY FOR LARGE SCALE SYSTEMS

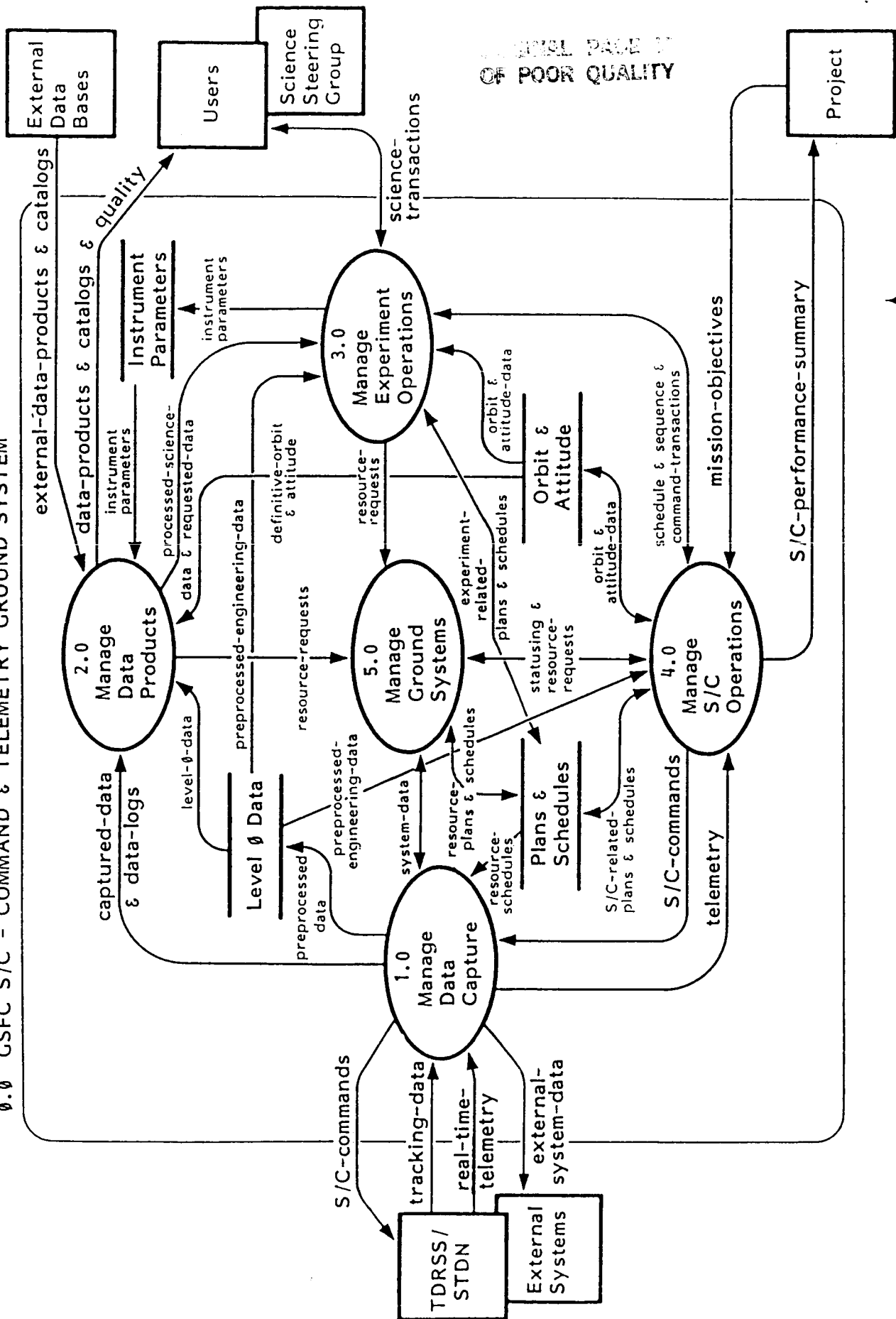
OBJECTIVE

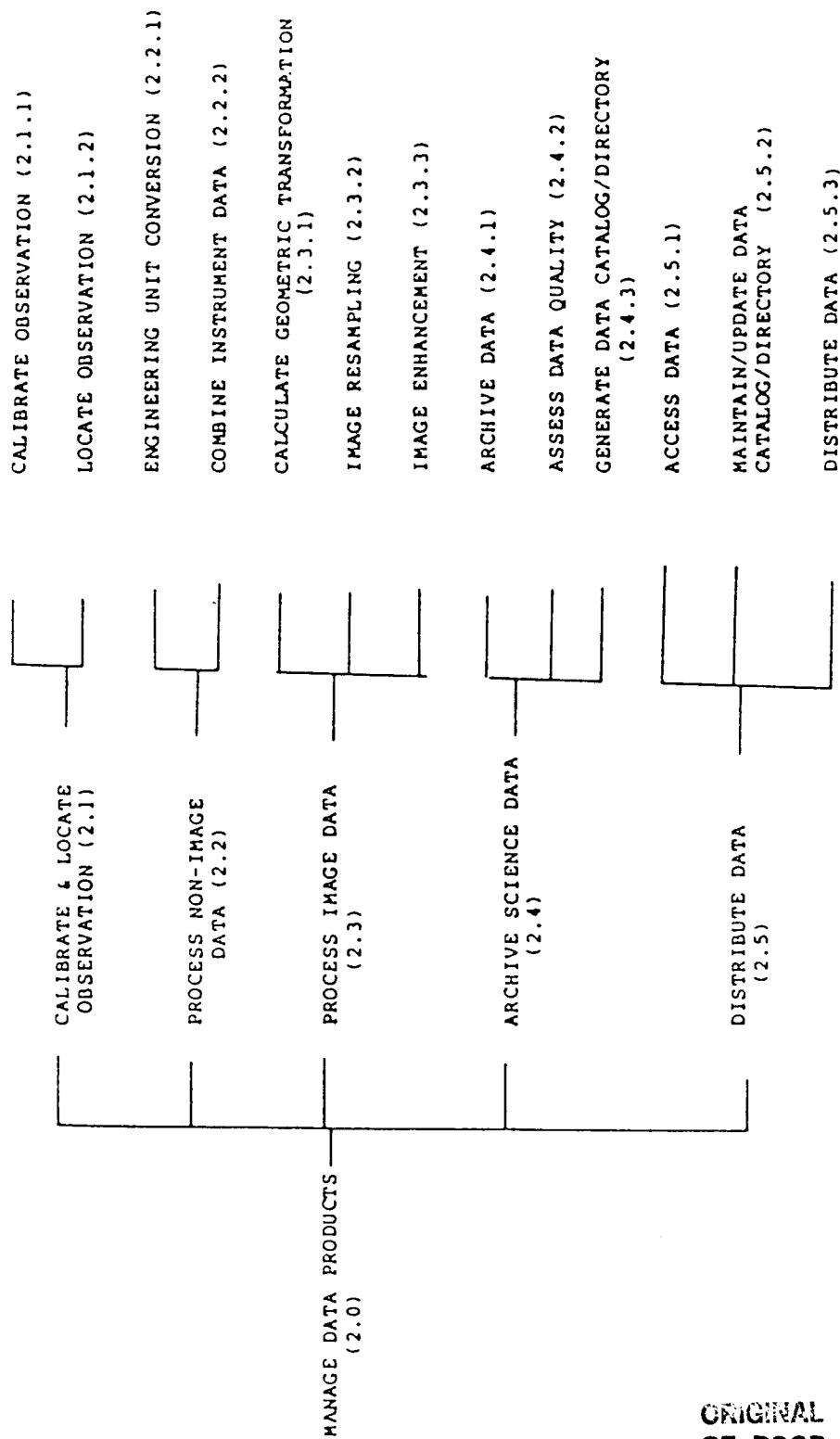
- o DEVELOP METHODOLOGIES FOR GENERATING AND ASSESSING
 - ALTERNATIVE DATA MANAGEMENT/HANDLING SYSTEMS
 - MISSION OPERATIONS CONCEPTS

APPROACH AND PRODUCTS

- o DEVELOP SYSTEM ENGINEERING "TOOL KIT"
 - GENERATE GENERIC SYSTEM FUNCTIONAL MODEL '84
 - DEVELOP REFERENCE DATA BASE '85-'85
 - DATA SET CHARACTERISTICS
 - EXPERIENCE WITH PAST MISSIONS
 - NEW TECHNOLOGIES
 - POTENTIAL DATA MANAGEMENT ISSUES
- o DEVELOP AND EVALUATE METHODOLOGY
 - DEVELOP SYSTEMATIC APPROACH TO DEFINING DATA MANAGEMENT SYSTEM ANALYSIS METHODOLOGY '84 MISSION OPERATIONS CONCEPT '84
 - DESIGN AND DEVELOP COMPUTER TOOL '85-'86 TO AID INTEGRATION OF METHODOLOGY STEPS
 - APPLY METHODOLOGY TO MISSIONS (UARS, HITCHHIKER-G, SPACE STATION PAYLOAD OPERATIONS, EOS) '85-'86

0.0 GSFC S/C - COMMAND & TELEMETRY GROUND SYSTEM





ORIGINAL PAGE IS
OF POOR QUALITY

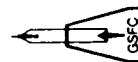
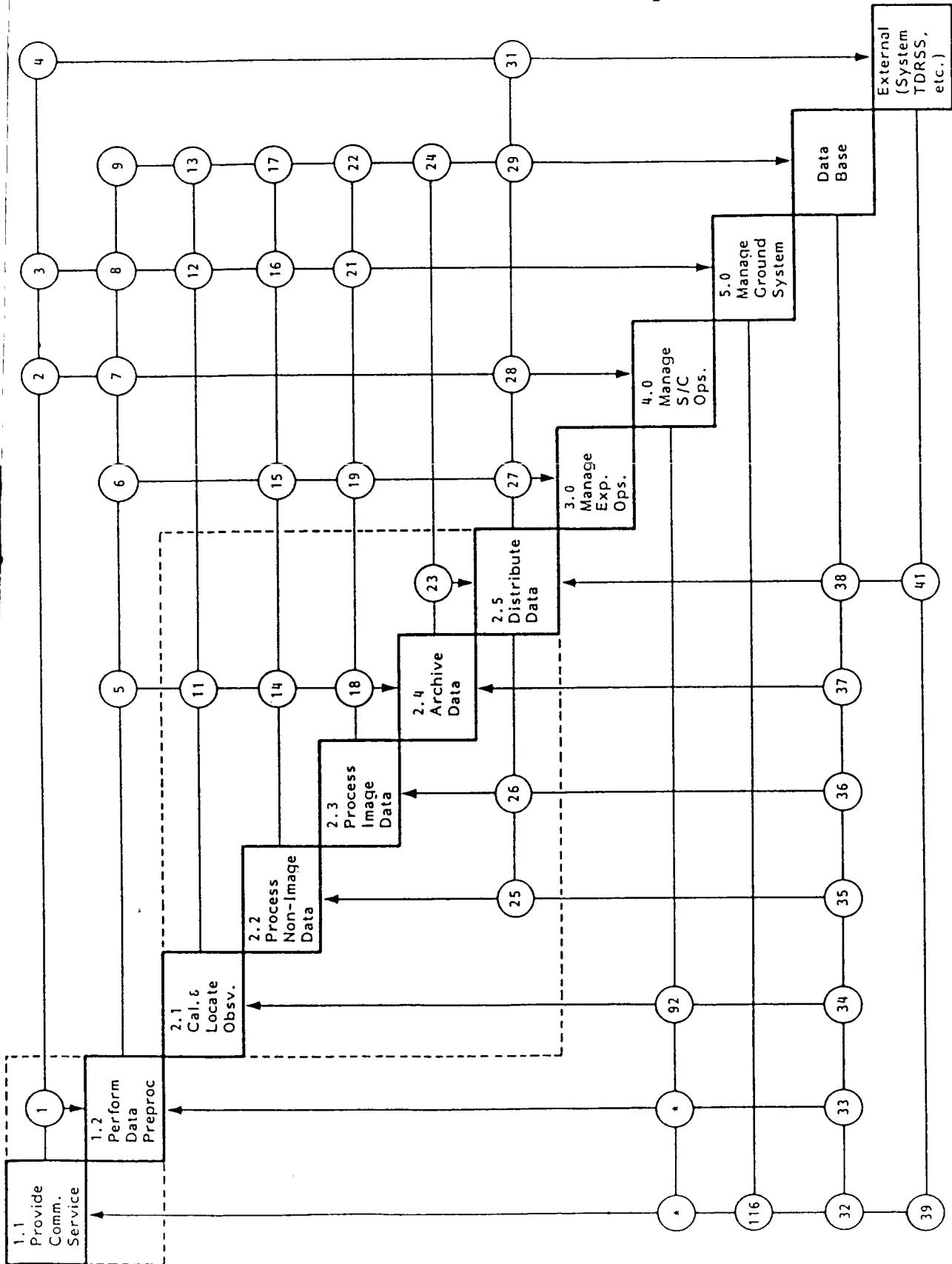
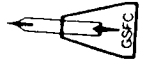


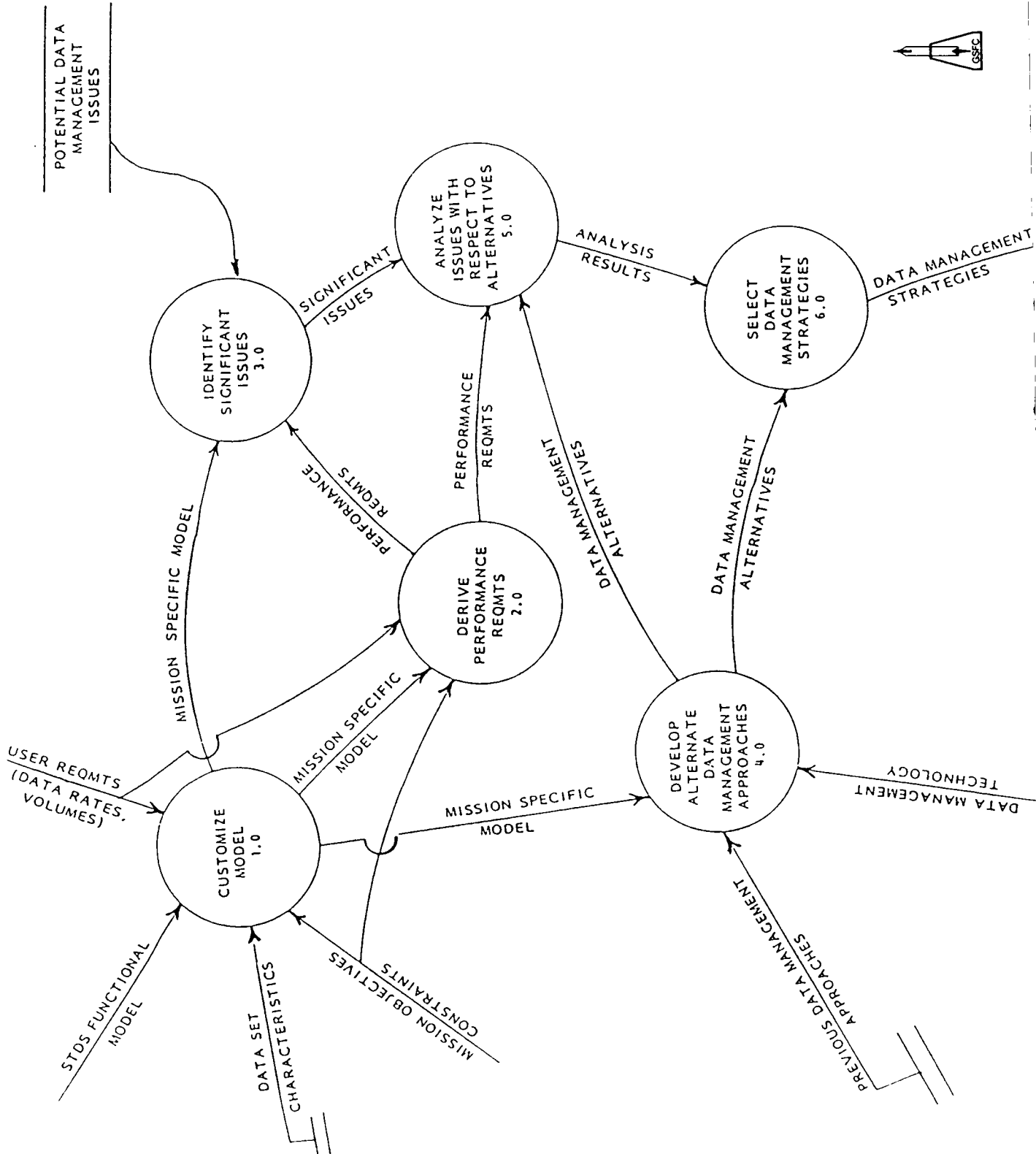
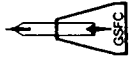
FIGURE A-2. MANAGE DATA PRODUCTS FUNCTION (2.0) TREES

ORIGINAL PAGE IS
OF POOR QUALITY



* See N² Chart for Producing Function **FIGURE 7-1 N² Relationship for Functions 1.0 and 2.0**

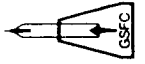
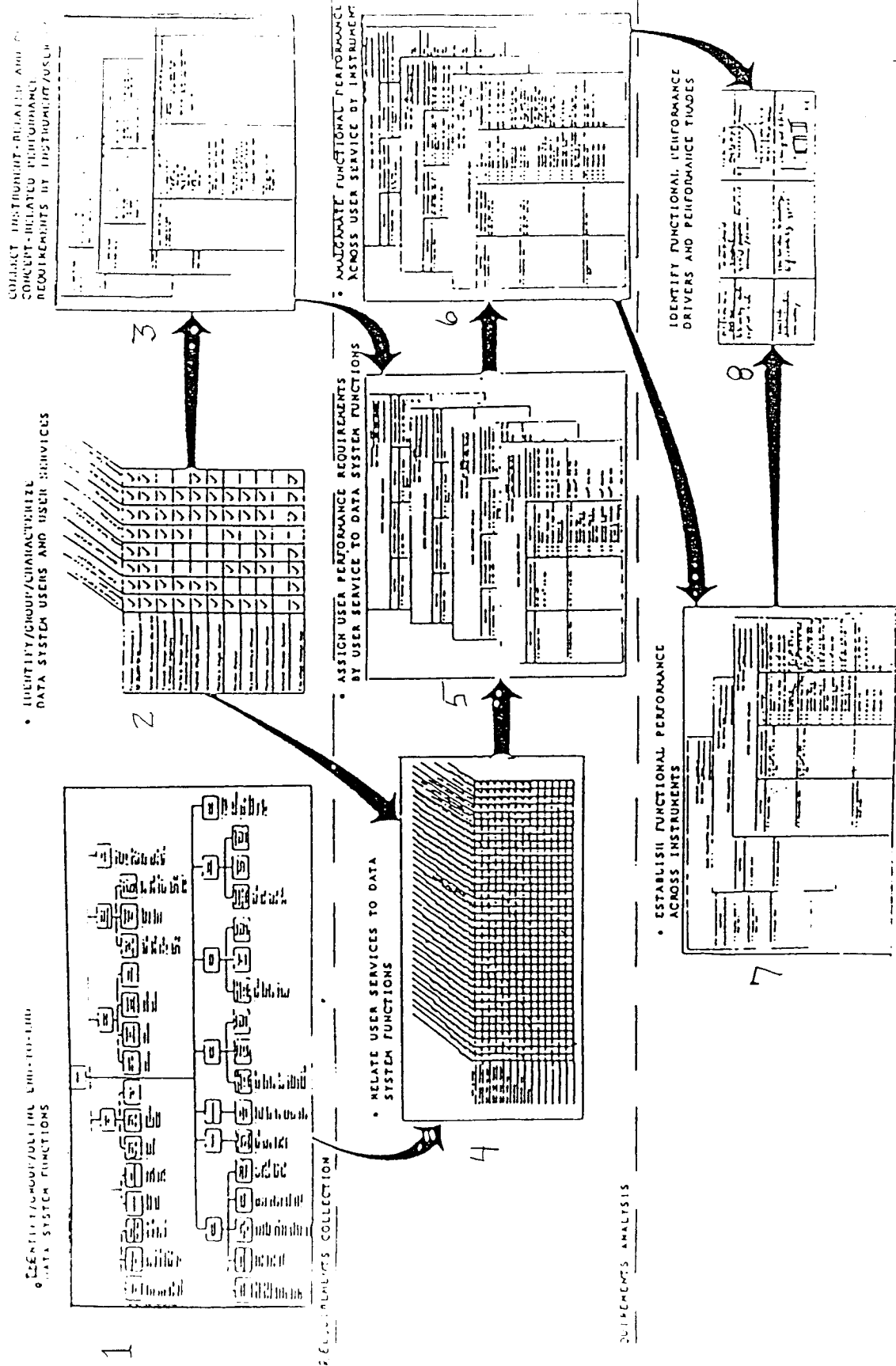
ORIGINAL PAGE IS
OF POOR QUALITY



FUNCTIONAL PERFORMANCE REQUIREMENTS METHODOLOGY

- o REQUIREMENTS COLLECTION
 - 1. IDENTIFY, GROUP & DESCRIBE END-TO-END DATA SYSTEM FUNCTIONS
 - 2. IDENTIFY, GROUP & CHARACTERIZE DATA SYSTEM USERS AND USER SERVICES
 - 3. COLLECT INSTRUMENT-RELATED, OPERATIONS-RELATED PERFORMANCE REQUIREMENTS BY INSTRUMENT/USER PAIR
- o REQUIREMENTS ANALYSIS
 - 4. RELATE USER SERVICES TO DATA SYSTEM FUNCTIONS
 - 5. ASSIGN USER PERFORMANCE REQUIREMENTS BY USER SERVICE TO DATA SYSTEM FUNCTIONS
 - 6. AMALGAMATE FUNCTIONAL PERFORMANCE ACROSS USER SERVICE BY INSTRUMENT
- o REQUIREMENTS SPECIFICATION
 - 7. ESTABLISH FUNCTIONAL PERFORMANCE ACROSS INSTRUMENTS
 - 8. IDENTIFY FUNCTIONAL PERFORMANCE DRIVERS AND TRADE-OFFS

ORIGINAL PAGE IS
OF POOR QUALITY



FUNCTIONAL PERFORMANCE REQUIREMENTS METHODOLOGY

SYSTEMS ANALYSIS METHODOLOGY FOR LARGE SCALE SYSTEMS

NEXT STEP - APPLICATION TO EARTH OBSERVATION SYSTEM (EOS)

o CHALLENGE

- STUDIES IN EARTH SCIENCE REQUIRE ANALYTIC AND CORRELATIVE STUDIES OF DATA FROM PAST, PRESENT AND FUTURE MISSIONS. DATA PREPROCESSING AND DELIVERY, DATA ARCHIVING, SCIENCE PROCESSING, AND AUTOMATED DATA COLLECTION/LOCATION (ADCLS) ARE KEY ELEMENTS OF EOS.

o APPROACH

- DEVELOP PROTOTYPE COMPUTER TOOL (PC TYPE DATABASE & SPREADSHEET), TEST USING UARS DATA
- CONDUCT SURVEY OF GSFC SCIENTISTS FOR MOST LIKELY EOS INSTRUMENTS (E.G., LASA, HMMR, MODIS) TO IDENTIFY
 - ANTICIPATED EOS USER COMMUNITY
 - SERVICES EXPECTED
 - GENERIC FUNCTIONS REQUIRED TO PROVIDE SERVICES
 - GENERIC PERFORMANCE ATTRIBUTES OF SERVICES
 - (DEVELOP USER SERVICE VS. PERFORMANCE MATRIX)
- IDENTIFY CRITICAL PERFORMANCE DRIVERS AND TRADEOFFS